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Chapter 20: Quantities

Overview

Quantities are calculated by many different methods. The type of
quantity, its unit of measurement, and how it is shown in the plans will
dictate the method used to calculate it. Since this is a CADD manual,
this chapter will go through the procedures used to calculate quantities
using plan and cross section drawings. A detailed description of each
item to be calculated, the means of calculation, and the accuracy
needed is reserved for another publication.

 These methods will only work if you use D&C
Manager to draw or set the symbology of the
elements you need to quantify.

This chapter is broken into two sections. Calculations in plan view and
calculations in cross sections. D & C Manager will be used to calculate
items in the plan drawing and XS Reports will be used to calculate items
in the cross section drawing.

Quantities in Plan Drawings

Three different types of quantities can be calculated in the plan drawing:
each, linear, and area. All of these will be calculated using the
computation tool in Design & Computation manager. Most of the items
that need to be calculated are set up in CFLHD's Design & Computation
Manager database. So, if you followed these standards while drawing
each element, quantity calculations will be easy. See the chapter on
D&C Manager for more information on drawing elements.

The D&C manager can be selected by picking Plan View Quantities on
Project Manager, or by selecting Design and Computation Manager
icon on the GEOPAK Main menu.

Figure 20-1: D&C Manager Icon

If you use Project Manager, GEOPAK will automatically set Design &
Computation Manager in Compute mode. If you select Design &

Computation Manager from the GEOPAK Main menu, you will need to shift it to Computation mode by picking the Compute button in the menu bar.
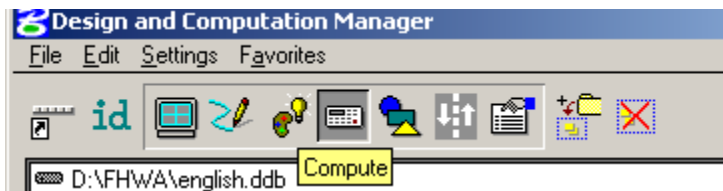

Figure 20-2: Compute Icon
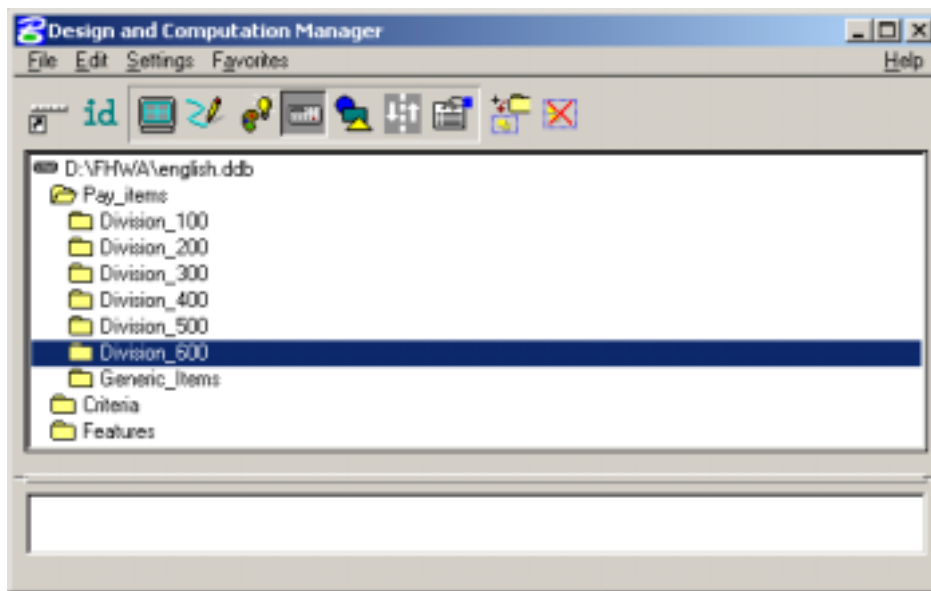
This will pop up the following two dialog boxes.

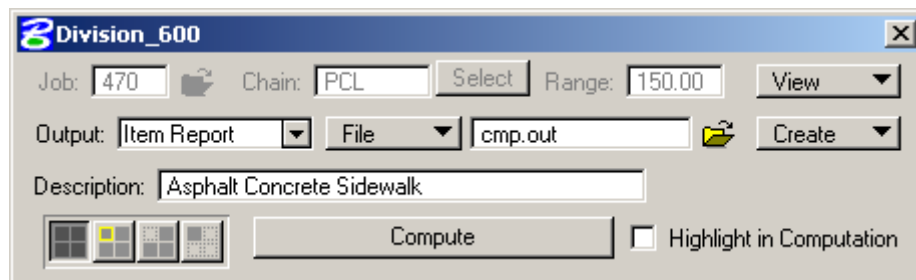**Figure 20-3: Select Item for Computation**

Figure 20-4: Compute Dialog

The first dialog box will allow you to select the items to be calculated. The second dialog box sets up the parameters for calculating and reporting the quantities. The following workflows will explain the processes for calculating quantities in each of the three types: each, linear, and area.

Examples of quantities to be calculated in units of each are, manholes, trees, lights, survey monuments, etc. The following workflow will guide you through the calculation process.

Workflow 1: Calculating "By Each" Quantities

1. *Select item or items that you want calculated using the D & C Manager item list. Double-clicking on the item to be calculated will populate collection box at the bottom.*
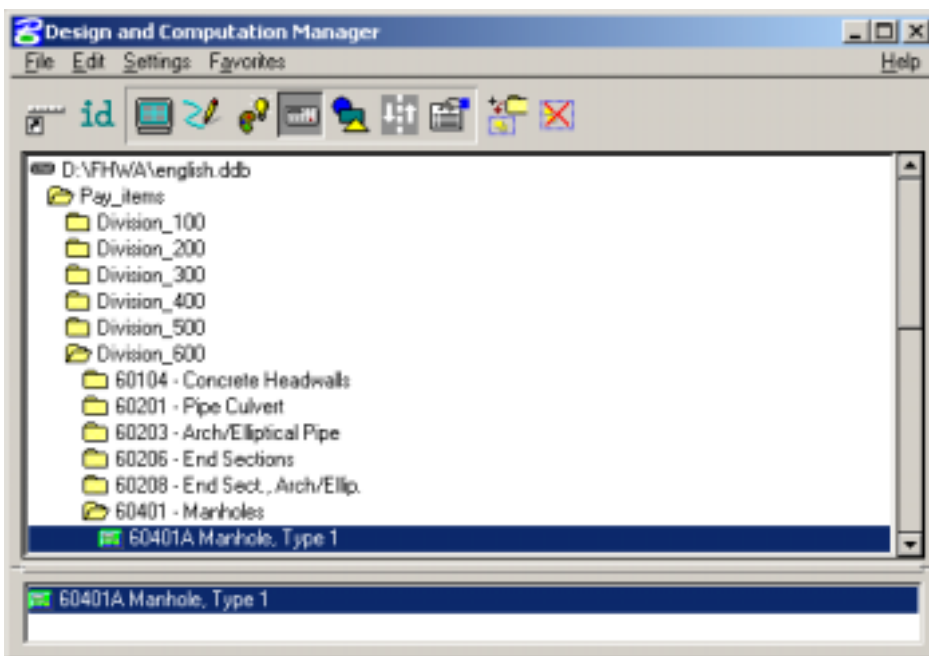

Figure 20-5: Item Selection

2. *Make sure the Job Number and Chain Name are correct. Output should be Comp Book, and set to create an output file rather than preview. Put a quantity description in the Description box and mark Highlight in Computation and hit Compute.*
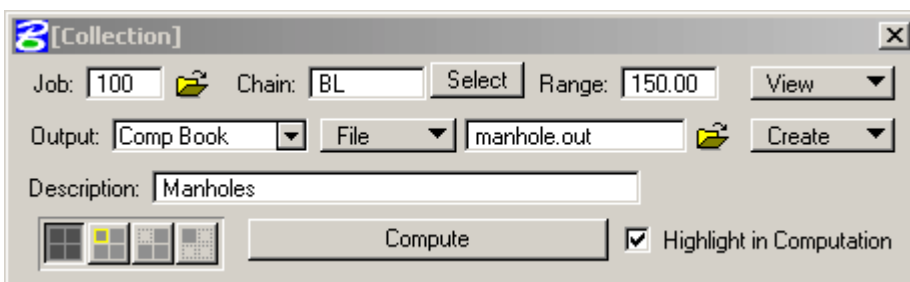

Figure 20-6: Compute Dialog

3. *This will create an output file that gives the station and offset, coordinates, and total quantity for the item.*

```
+---------------------------------------------------------------------------+
|                                                         Page No.    1      |
|   Item: 60401A                            File Name: manhole.out           |
|   Desc: Manhole, Type 1                        Unit: EA                    |
|                                                                            |
+-----------+-------------+----------+--------------+--------------+----------+
| Baseline  |   Station   |  Offset  |   Northing   |   Easting    | Quantity |
+-----------+-------------+----------+--------------+--------------+----------+
| BL        |   12+61.13  |     1.73 |  623977.6060 |  196959.9780 |    1.00  |
| BL        |   11+94.34  |    -4.53 |  624019.3080 |  196907.4440 |    1.00  |
| BL        |   13+11.92  |    -1.52 |  623952.5970 |  197004.3040 |    1.00  |
| BL        |   12+25.27  |    -1.11 |  623999.5620 |  196931.4870 |    1.00  |
+-----------+-------------+----------+--------------+--------------+----------+
| Item Total:      4   Unit: EA                                      4.00    |
+---------------------------------------------------------------------------+
```

Figure 20-7: Output

Examples of linear quantity calculations are fence, gutter, guardrail, etc. The following Workflow will guide you through the calculation process.

Workflow 2: Calculating "Linear" Quantities

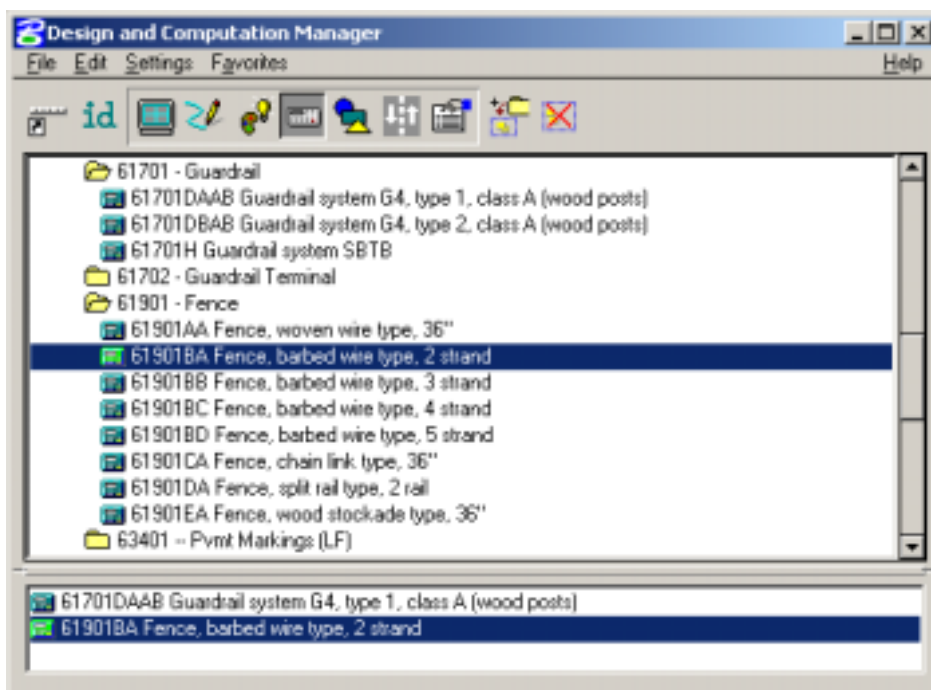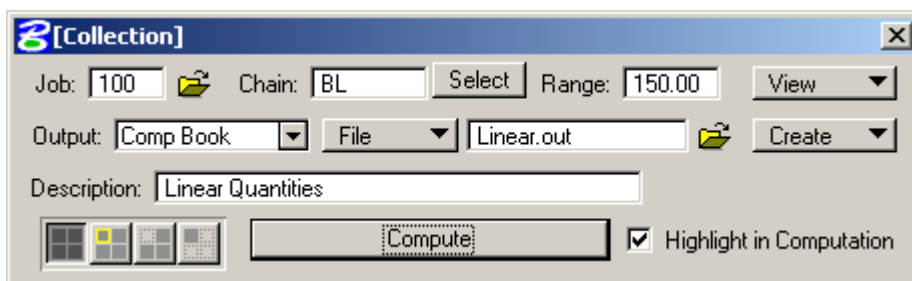1. *Select item or items that you want calculated using the D & C Manager item list.*

Figure 20-8: Multiple Item Selection

2. *Make sure the Job Number and Chain Name are correct. Output should be Comp Book, and set to create an output file rather than preview. Put a quantity description in the Description box and mark Highlight in Computation and hit Compute.*

Figure 20-9: Compute Dialog

3. *This will create an output file that will give the station and offset of the beginning and ending points of the element and the individual and total lengths.*

Figure 20-10: Output

Notice, in the example above, multiple quantities were calculated at once. You can add the items that you need calculated in the collection box by double clicking on it. If you want to remove an item from the collection box, simply double click on it in the box.

Examples of area quantities that are calculated in the plan view are, sidewalk and concrete pavement. Since GEOPAK uses shapes to calculate areas, area quantities are not quite as simple as the "By Each" and linear quantities, but once you get used to it, it is a time saver. The following Workflow will guide you through the process.

Workflow 3: Calculating "Area" Quantities

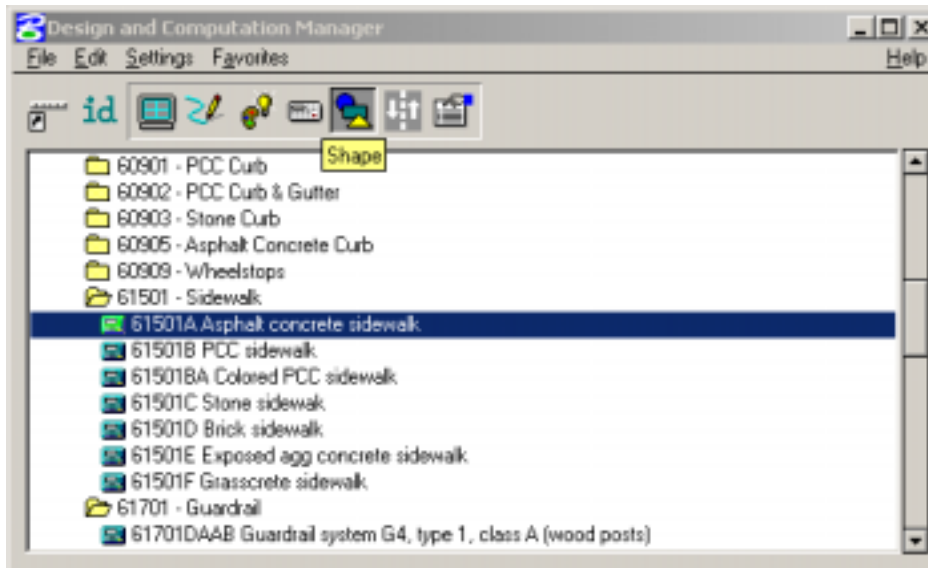1. *Highlight the item you want to calculate, then pick the Shape button on the menu bar.*

Figure 20-11: Place Shape Icon
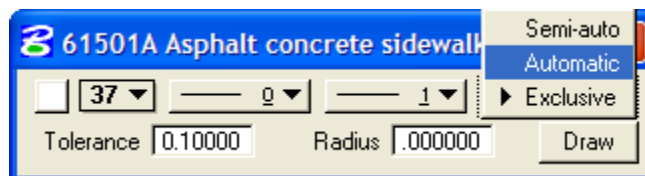
2. *The following dialog box will come up.*

Figure 20-12: Place Shape Dialog

The correct level symbology will be automatically input. The Automatic button has three choices: Semi-auto, Automatic, and exclusive. Semi-auto will allow you to pick the items you want to create the shape with, Automatic will create a shape around a point that you pick inside your area, and exclusive will create a shape where you want to exclude an area such as a planter in the sidewalk.

3. *The two methods that you can use are Automatic and Exclusive. Exclusive is used when there is a deduction from the area, for example a planter in the middle of a sidewalk. Automatic is used when there is no need for deduction. The easiest method is Automatic; the tolerance and radius values can be adjusted if*

automatic is not working. Pick Draw and pick a data point in the middle of the area that you want the shape in. GEOPAK will draw the shape. When you pick draw with Exclusive, GEOPAK will prompt you to pick a data point inside the outside shape. Once If you pick that data point, GEOPAK will highlight the outer shape and then prompt you to pick inside the inner shape to deduct. Once that data point is selected, GEOPAK will draw the shape with the hole in it.

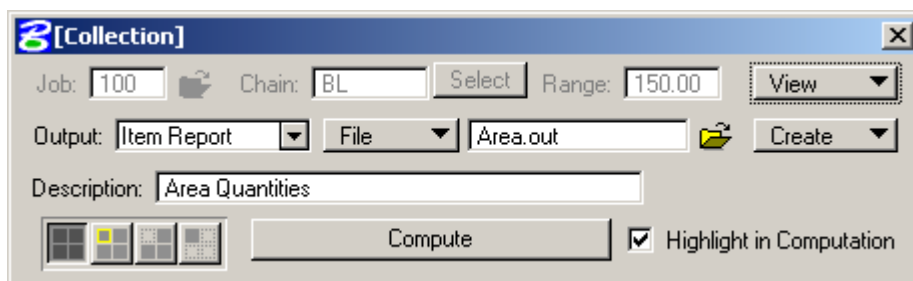4. *Go back to compute mode in D&C Manager and the following dialog box will appear.*

Figure 20-13: Compute Dialog

Change the Output to Item Report and pick Compute. The following report is what will be produced.

Figure 20-14: Output

GEOPAK can also calculate volumes and weights of items such as pavement and base course. But because the pavement and base course have edge tapers, these quantities are more accurately calculated using a spreadsheet or in the earthwork run.

Quantities in Cross Sections

Besides Earthwork, surfacing, pavement removal, and topsoil, the cross sections are used to calculate seeding and clearing. The earthwork and topsoil calculations will be covered in another chapter. This chapter will provide workflows that show you how to calculate the other two quantities.

Workflow 4: Calculating "Clearing" Quantities

1. *Open your cross section file and access the XS Reports dialog box.   This can be done by pressing the Reports & XS Quantities button in the bottom right hand corner of Project Manager, or by pressing Applications>GEOPAK ROAD>Cross Sections>Reports,*
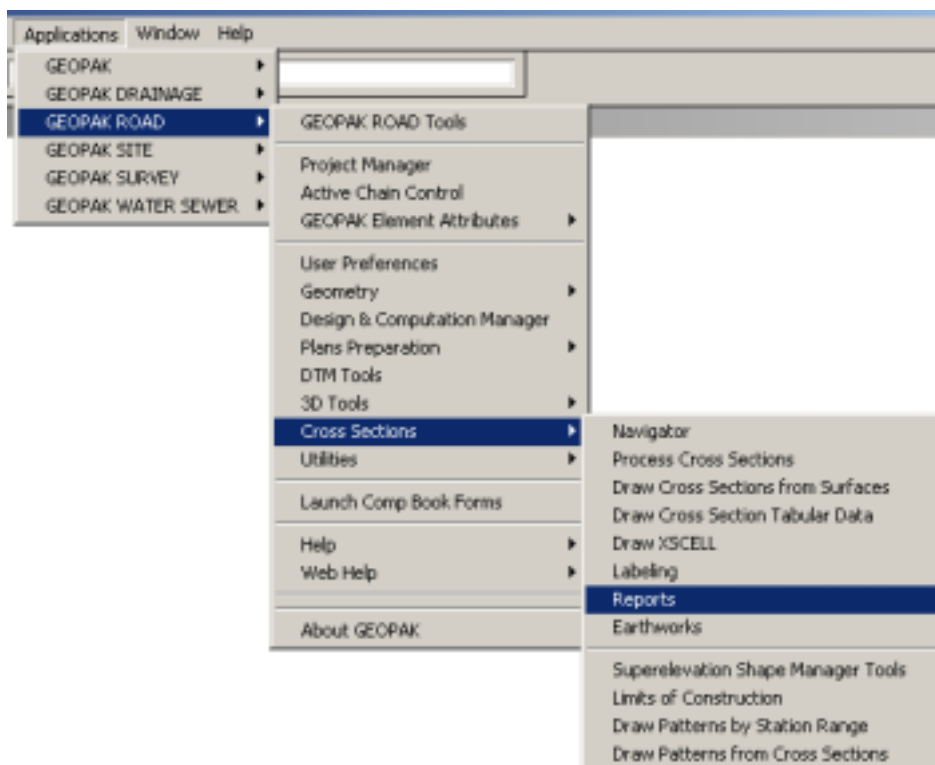

Figure 20-15: Accessing Reports

or by pressing the XS Reports button on the main cross-section palette.
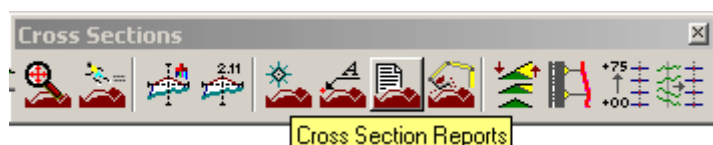

Figure 20-16: Reports Icon
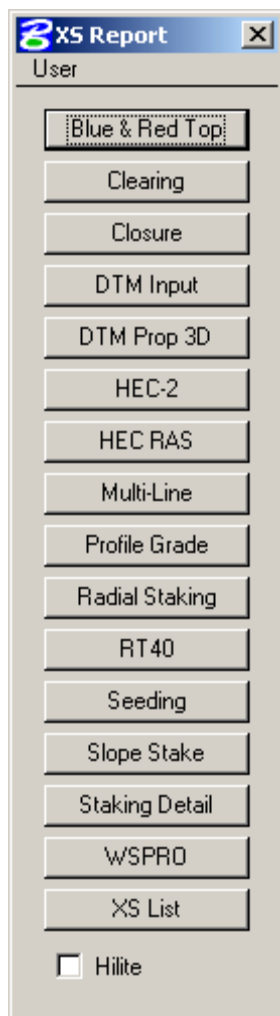
2. *This will bring up the following dialog box.*

Figure 20-17: Reports Dialog

Press User>Preferences to bring up the following dialog box.
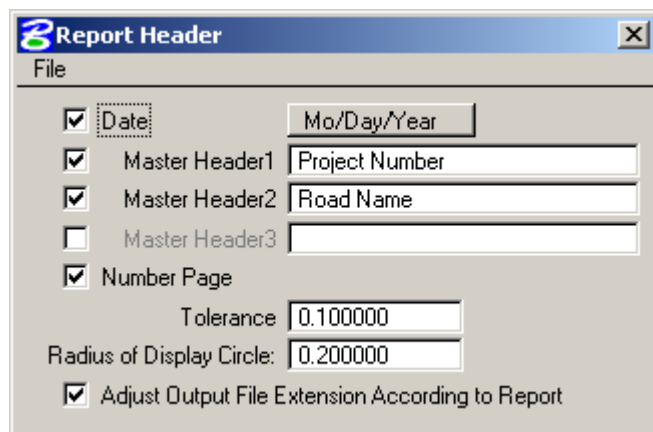

Figure 20-18: Report Settings

4. *This information will be put at the top of the quantity report. Include the Project Number in the Master Header 1 space, and the Road Name in the Master Header 2 space.*

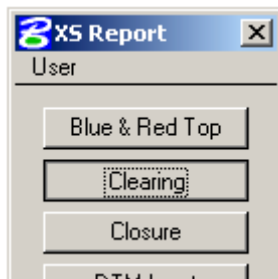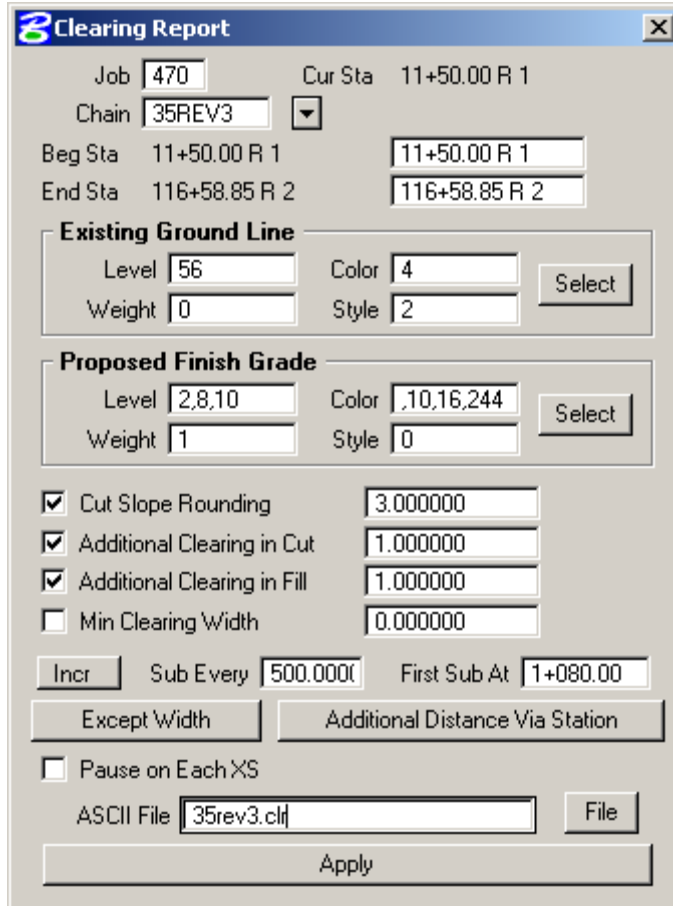5. *Press the Clearing button in the XS Report dialog box.*

Figure 20-19: Clearing Button

6. *This will bring up the following dialog box. Make sure you check the Beg Station and End Station to ensure that they are the stations you want. For multiple station ranges, the report may need to be run multiple times. The symbology for the Existing Ground will not change, and the symbology for the Proposed Ground should allow GEOPAK to trace completely across from the left catch point, over the top of pavement to the right catch point. Cut slope rounding, Additional Clearing in Cut, and Additional Clearing in Fill should match what is shown in the typical sections. Each project may have different values. However, typical values are 3.0 m or 10 ft. for Cut Slope Rounding and the Additional Clearing in Cut and Fill should be set at 1.0 m or 3 ft. The increment is set at 500 m or 1000 ft.*
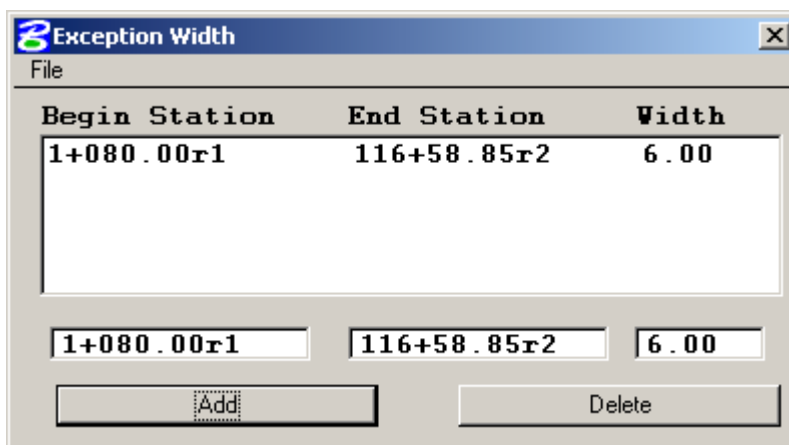
Figure 20-20: Clearing Report Dialog

The Except Width can be used to subtract out the existing pavement width. CFLHD typically does not subtract the existing pavement out, but this can be used if needed. Press the Except Width button to get the following dialog box

Figure 20-21: Exception Width

7. *Fill in the beginning station, ending station, and width, then press add.*

8. *Type in the filename for your output, then press Apply. The following output file is produced.*


```
07/30/2004                              Project Number              Page# 1
                                           Road Name
                                        CLEARING REPORT

CUT SLOPE ROUNDING           =      3.0000 Ft
ADDITIONAL CLEARING IN CUT   =      1.0000 Ft
ADDITIONAL CLEARING IN FILL  =      1.0000 Ft
MINIMUM CLEARING WIDTH       =      0.0000 Ft
SUBTOTALS EVERY     500.0000 Ft. BEGINNING AT STATION 10+80.00 METHOD INCR
ADDITIONAL CLEARING   LEFT   SIDE                  = 0.00            Ft
ADDITIONAL CLEARING   RIGHT  SIDE                  = 0.00            Ft

STATION          CLEARING  DISTANCE    EXCEPTION      AREA      SUBTOTAL  AREAS
                 LT        RT          WIDTH          SF        SF        ACRES

  11+50.00 R 1    5.57      7.28                                  0
                                        0.00          136
  11+60.00 R 1    7.21      7.13
                                        0.00          306

  (file condensed to fit information into example)

                                        0.00          843
  19+40.00 R 1   34.56      7.95
                                        0.00          877
  19+60.00 R 1   36.97      8.19
                                        0.00          931
  19+80.00 R 1   39.24      8.60
                                        0.00          961
  20+00.00 R 1   38.81      9.44                                12495   0.2868  (ACCUM SF 21184.0000 )
DEDUCTED    ACRES  =      0.0000
TOTAL       SF     =  21184.0000
TOTAL       ACRES  =      0.4863
```

Figure 20-22: Output

Workflow 5: Calculating "Seeding" Quantities

1. *Follow steps 1 through 4 in workflow 4.*

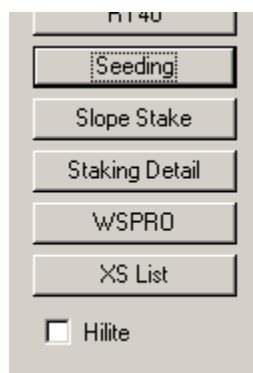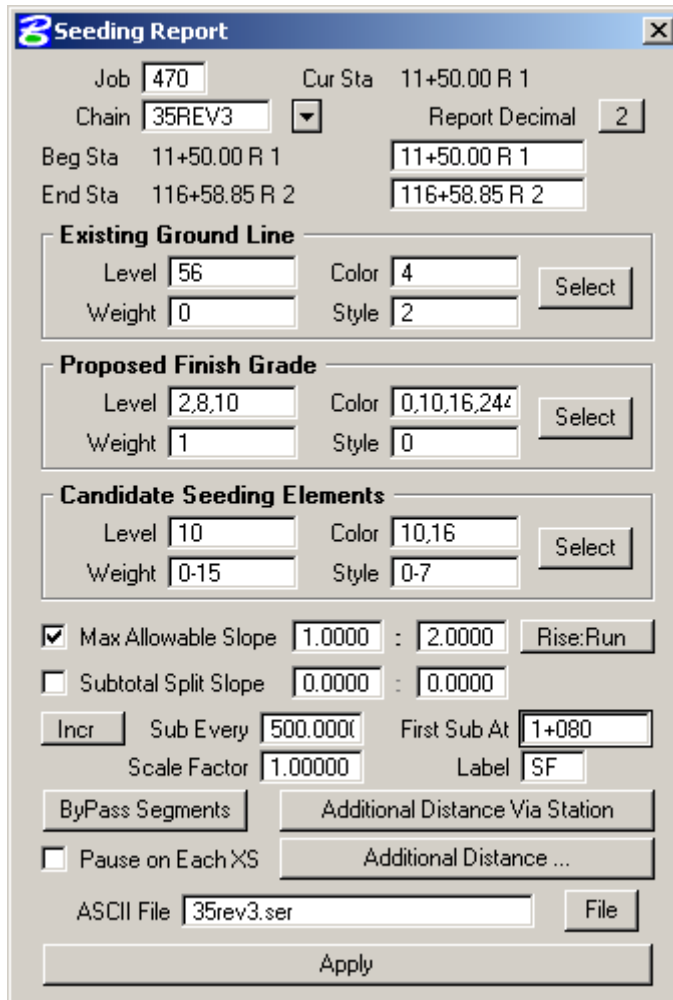2. *Press the Seeding button on the XS Report dialog box.*

Figure 20-23: Seeding Button

3. *This will bring up the following seeding dialog box. The elements are the same as the clearing report with some additional needed information. The Candidate Seeding Element section needs the symbology of the slopes that will be seeded (typically the cut, fill,*

and ditch foreslopes). These are the slopes that will be seeded. The Max allowable slope can vary on each project. This slope will be determined during the project, but for preliminary quantity calculations, you should use 1V:2H as the max allowable slope.
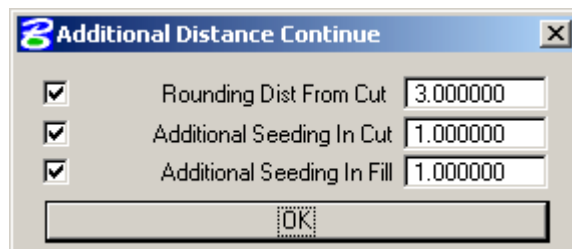
Figure 20-24: Seeding Report Dialog

4. *Pick the Additional Distance button to bring up the following dialog box.*

Figure 20-25: Additional Distance

5. *Fill in the appropriate values. They should be the same as the Cut Slope Rounding and Additional clearing in fill values used in the clearing report. Type in the output file you want GEOPAK to write*

the quantities into and press Apply. GEOPAK will produce the following file.

```
07/30/2004                              Project Number                        Page# 1
                                          Road Name
                                        SEEDING REPORT

NUMBER OF LEFT  CUT  SLOPES TO BE BYPASSED        = 0
NUMBER OF LEFT  FILL SLOPES TO BE BYPASSED        = 0
NUMBER OF RIGHT CUT  SLOPES TO BE BYPASSED        = 0
NUMBER OF RIGHT FILL SLOPES TO BE BYPASSED        = 0
ROUNDING DISTANCE FROM CUT SLOPE STAKE            = 3.00        Ft
MAXIMUM ALLOWABLE SLOPE FOR SEEDING/SODDING 1.0000  / 2.0000  Rise over Run
ADDITIONAL SEEDING    LEFT    SIDE                = 0.00        Ft
ADDITIONAL SEEDING    RIGHT   SIDE                = 0.00        Ft
ADDITIONAL SEEDING IN CUT                         = 1.00        Ft
ADDITIONAL SEEDING IN FILL                        = 1.00        Ft
SUBTOTALS EVERY      500.0000 Ft BEGINNING AT STATION 10+80.00 METHOD INCR
SCALING FACTOR            =          1.00000           WITH LABEL        [ SF ]


STATION              SLOPE DISTANCE   AVERAGE SLOPE DIST       A R E A      SF    SUBTOTAL  A R E A      SF
                     LT       RT       LT       RT          LT       RT   BOTH     LT         RT      BOTH
                       (TOTAL)


11+50.00 R 1         0.00    0.00                                                  0        0         0
                     (    0.00)      1.37     0.60        14       6     20
11+60.00 R 1         2.73    1.20
                     (    3.93)      3.95     1.34        79       27    106
11+80.00 R 1         5.17    1.48
                     (    6.65)      9.31     1.33        186      27    213

  (file condensed to fit information into example)

                     (    5.95)      2.25     3.90        45       78    123
19+80.00 R 1         2.25    4.10
                     (    6.35)      2.25     4.53        45       91    136
20+00.00 R 1         2.25    4.95                                                  1675     1617      3293
                     (    7.20)


TOTAL           LEFT             RIGHT            BOTH
  SF=         4203.0000        3235.0000        7441.0000
ACRES=         0.0965           0.0743           0.1708
```

Figure 20-26: Output